3.8 Noise

Review of EIS Section and Previous Analysis

The current project would add an auxiliary lane, which was only briefly described and not analyzed for Noise in the original 1992 Final EIS; this lane would also slightly change the alignment of bridges and lanes. Adding the auxiliary lane alone would be enough to require a new noise analysis, according to federal regulation 23 CFR 772 and WSDOT noise policy. The regulations require noise to be considered if a highway adds a through lane of traffic, substantially changes the horizontal or vertical alignment of existing lanes of traffic, or changes the existing terrain so that there is a substantial increase in noise.

The affected environment has also changed since the 1992 Final EIS was published; these changes include the following:

- The mobile home park near SR 202, identified as Site 4, has been removed (and this mobile home park no longer exists).
- The residential area, represented as Site 6 in the document, received noise mitigation and does not warrant further consideration.
- The bicycle and pedestrian path, Site 23, along the southern right-of-way has been abandoned and replaced by a new path.
- Site 19 represents this new bicycle and pedestrian path, the Bear Creek Trail, north of the SR 520 right-of- way.
- The traffic volumes used in this new analysis consider the results of the recently completed traffic analysis also completed for this addendum (please see Appendix F, *Transportation Discipline Report*).

Aside from the items noted above, land uses sensitive to noise remain similar to those conditions reported in the 1992 Final EIS. This is largely because the original 1992 analysis estimated high traffic volumes and because of the character of sound itself. The 1992 Final EIS, however, did not mention several criteria that are standard practice for current noise analysis, including the following:

- Defining the approach criteria and using it to ascertain impacts as defined in 23 CFR 772.5 (g)
- Defining reasonable and feasible abatement criteria and using these criteria to consider proposed project mitigation as defined in 23 CFR 772.11
- Defining the substantial reduction that is required by 23 CFR 772.11(d) and identifying the benefited residents and/or residential equivalents according to WSDOT's noise policy and Departmental Directive (DD) 22-22 (WSDOT 1987)

Since the 1992 Final EIS was published, the City of Redmond has implemented its own traffic noise standards in RCDG Section 20 D.100, which is part of the Redmond Municipal Code (RMC). These regulations, as well as the RMC for considering construction noise impacts, are discussed in greater detail in the "Methodology" and "Impacts" sections below.

The federal regulation does not define construction noise impacts but requires that steps be taken to determine the effect this noise might have on activities within the study area. The discussion of construction noise impacts in the 1992 Final EIS on residents within 500 to 1,000 feet of the project activities is accurate, and additional analysis of these impacts is not needed.

Methodology

A traffic noise impact is defined in 23 CFR 772 as an impact that occurs when the predicted traffic noise levels approach or exceed the noise abatement criteria (NAC) (Table 3.8-1), or when the predicted traffic noise levels substantially exceed existing noise levels. Table 3.8-1 was described in the original 1992 Final EIS, however, the term "approach" was not defined. The Federal Highway Administration (FHWA) leaves the definitions for "approach" and "substantially exceed existing level" to the states to define. In 1995, however, FHWA published a memorandum that required all states to adopt a policy that would define "approach" to be at least 1 decibel (dB) below that level shown in the NAC. Before this, WSDOT defined "approach" to be 2 dB; WSDOT has always defined a "substantial increase over existing" to be 10 dB.

TABLE 3.8-1
Noise Abatement Criteria

Activity Category	L_{eq} (h)[1]	L_{10} (h)[1]	Description of Activity Category
A	57 (exterior)	60 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where preserving these qualities is essential if the area is to continue to serve its intended purpose
B	67 (exterior)	70 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, school, churches, libraries, and hospitals
C	72 (exterior)	75 (exterior)	Developed lands, properties, or activities not included in Categories A and B above
D	--	--	Undeveloped lands
E	52 (interior)	55 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

[1]dBA Decibels on hourly A-weighted sound level); either L_{10} (h) or L_{eq} (h), but not both, may be used on a project
L_{10} (h) The hourly value of the sound level that is exceeded 10 percent of the time.
L_{eq} (h) The hourly value of the equivalent sound level.

The noise analysis for this addendum uses the FHWA Traffic Noise Model (TNM) 2.5. In this analysis, all households within 500 feet of the project that approach or exceed the federal NAC of 67 decibels on an A-weighted scale (dBA), or 66 dBA in Washington State, would be

considered impacted by noise and considered for mitigation. Mitigation is determined to be feasible to build when it reduces sound levels at most of the first row of homes by 5 dBA or more, with the sound level for at least one home reduced by 7 dBA or more. Mitigation is determined to be reasonable or cost effective to build by summing up the allowed barrier square footage allotted to each household that receives at least a 3 dB reduction in sound level (Table 3.8-2). If the total square footage of the proposed noise barrier is less than the total allotted square footage, then the barrier is considered reasonable. Section 20D.100.10-070(4)(a), the City of Redmond's traffic noise regulation, considers a 5 dB or more reduction to be reasonable.

In the case of parks, schools, churches, and other nonhousehold features in the study area, the number of people using these facilities at any given moment must be converted to an equivalent number of households or residential equivalents. WSDOT's DD 22-22 is used to calculate a residential equivalent for the reasonableness determination. When determining reasonableness, WSDOT more readily attempts to reduce noise to the affected residents, as the traffic noise gets louder. The allowance table, Table 3.8-2, makes this possible and is used to determine reasonableness on this project.

TABLE 3.8-2
Reasonably Allowable Barriers Table

Design Year Traffic Noise Decibel Level (dBA)	Allowed Cost Per Household[1]	Equivalent Wall Surface Area Per Household
66	$37,380	700 ft^2 (65.0 $m^{2)}$
67	$41,110	768 ft^2 (71.3 m^2)
68	$44,640	836 ft^2 (77.7 m^2)
69	$48,270	904 ft^2 (84.0 m^2)
70	$51,900	972 ft^2 (90.3 m^2)
71	$55,530	1,040 ft^2 (96.6 m^2)
72	$59,160	1,108 ft^2 (102.9 m^2)
73	$62,790	1,176 ft^2 (109.3 m^2)
74	$66,420	1,244 ft^2 (115.6 m^2)

[1]Reevaluated each year; based on $53.40 per ft^2 constructed cost
dBA decibel on an A-weighted scale
ft^2 square feet
m^2 meter squared

For this analysis, the noise discipline team measured sound levels with an Ono Sokki LA-4350 meter equipped with a type I microphone. The sound levels measured in the original noise analysis were also further validated. Traffic volumes for the model were taken from current traffic data where available. Table 3.8-3 indicates the revisions to the traffic mix of automobiles, medium trucks, and heavy trucks reported in the 1992 Final EIS.

TABLE 3.8-3
Traffic Percentages Used in FHWA Noise Model

Roadway	Autos (Percent)	Medium Trucks (Percent)	Heavy Trucks (Percent)
SR 520 (eastbound)	(~~97.8~~) 96.8	(~~0.9~~) 1.6	(~~0.9~~) 1.6
SR 520 (westbound)	(~~96.8~~) 94.3	(~~0.9~~) 3.9	(~~2.3~~) 1.8

(~~xx.x~~) Original percentages used in 1992 Final EIS

Coordination Efforts

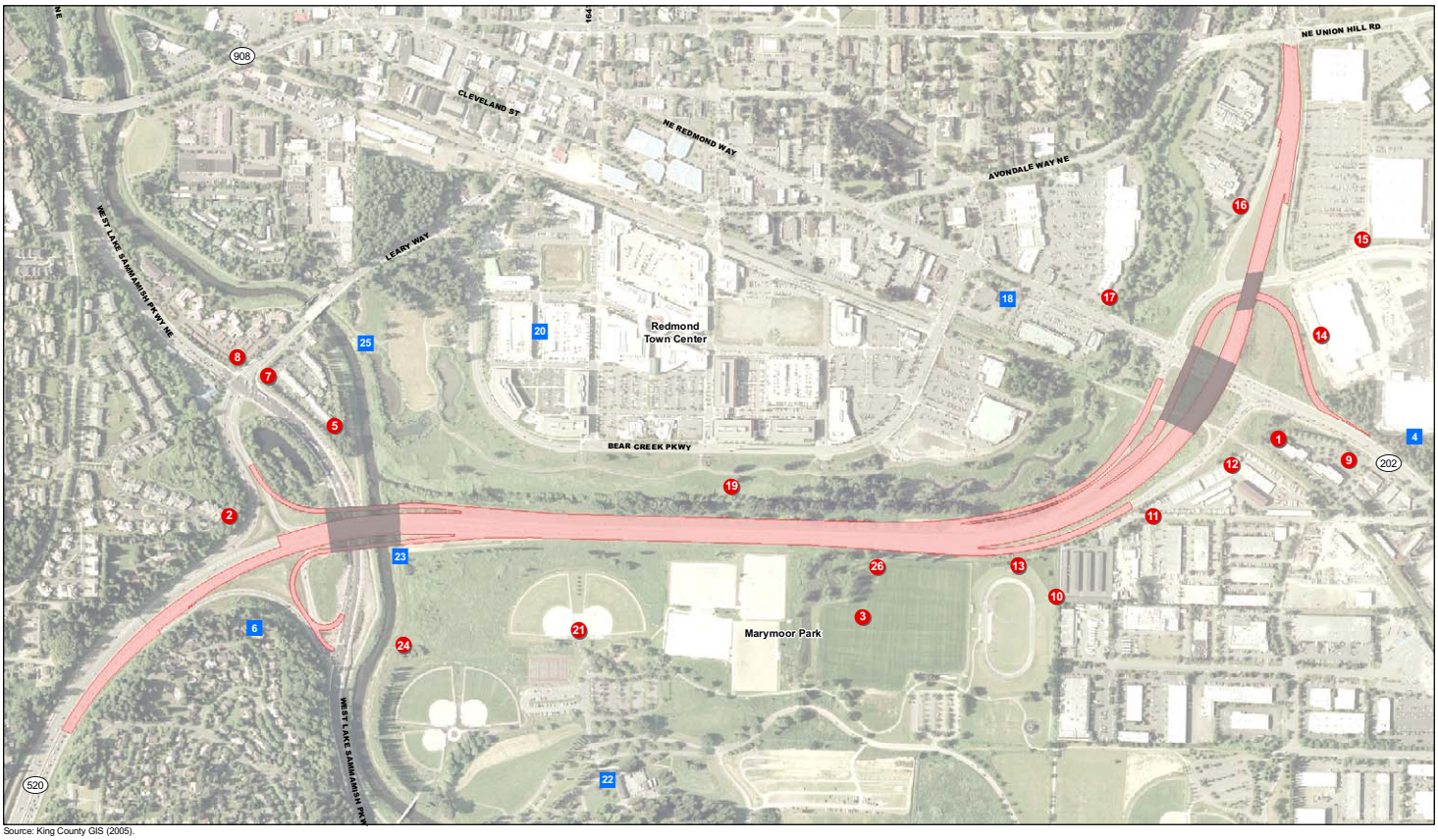
In determining the number of residential equivalents used in the reasonableness calculations, recreational activities and use levels were determined through coordination with the King County Parks and Recreation Department, Marymoor Parks Scheduling. The data provided were used in accordance with WSDOT's DD 22-22 to calculate a residential equivalent for the reasonableness determination.

During the construction permitting phase and after the project design has moved closer to construction, lane closures necessary on the state highways might necessitate conducting work at night. If night work is required, then coordination with the City of Redmond (per RMC and RCDG) would be necessary to secure a noise variance. These regulations are discussed in greater detail in the "Construction Impacts" section below.

Affected Environment

The original 1992 Final EIS accurately describes most of the existing sound level environment that this project would affect. Figure 3.8-1 shows the noise receptor sites analyzed in the 1992 Final EIS and subsequently considered for this addendum's noise analysis. Three noise receptor sites in the 1992 Final EIS that have noticeably changed are shown in Figure 3.8-1 and are listed below:

- **Receptor Site 4:** The mobile home park site was being graded the day of the site visit. A sign stating that the site was available for commercial construction was posted in this area. The land use category has changed to undeveloped since the original analysis. No noise impacts have been identified for this undeveloped property.
- **Receptor Site 6:** Previous WSDOT project SR 520: 104th Avenue NE to West Lake Sammamish Parkway has mitigated noise impacts on the Willows neighborhood. A barrier was constructed on private property with the permission of the Willows Neighborhood Association. Analyzing this barrier's effectiveness is beyond the scope of this addendum. This site has been removed from the list of areas analyzed for noise impacts.
- **Receptor Site 23:** This site adjacent to Marymoor Park was identified in the 1992 Final EIS as a bicycle and pedestrian path; now it appears to be abandoned. This site, too, has been removed from the list of receptors analyzed. A more likely pedestrian and bicycle path through this corridor is the Bear Creek Trail. Receptor Site 19 representing the Bear Creek Trail in this study replaces Receptor Site 23 in the original study.



Source: King County GIS (2005).

Noise Receptor Sites

Sites Analyzed in the 1992 Final EIS but not the Current Analysis

Project Footprint (Edge of Pavement)

Overpass

N

0 500 1,000

Approximate scale in feet

FIGURE 3.8-1

Receptor Site Locations

SR520/West Lake Sammamish Parkway to SR 202

File Path: H:\WSDOT\184764SR520\GIS\Layouts\Noise_receptors.mxd, Date: February 20, 2006 10:43:51 AM

Other areas of the affected environment identified in the 1992 Final EIS that have changed or are no longer considered in this addendum's analysis include Redmond Town Center Receptor Sites 20 and 25. The buildings and terrain were not included in the original modeling for the project because the land was vacant at the time of the study. The Redmond Town Center has not been included in this study because the receptors are beyond the 500-foot limitation of the FHWA TNM. Other receptor locations where receptors were identified in the 1992 Final EIS beyond the 500-foot limit include downtown Redmond commercial (Receptor Site 18) and Receptor Site 22 in Marymoor Park near the windmill. WSDOT policy is now—and has always been—limited to analyzing noise to only 500 feet beyond the project limits. Receptor Sites 18 and 22 are, therefore, no longer considered in this addendum's analysis.

Sound levels for existing AM and PM peak hour traffic volumes are shown in Table 3.8-4 and correspond with sound levels reported in the SR 520 Noise Projections Summary Table in the 1992 Final EIS.

TABLE 3.8-4
SR 520 AM and PM Peak Hour Noise Levels and Noise Abatement Criteria

Receptor Site Number	FHWA Land Use Activity Category	FHWA Noise Abatement Criteria	Existing (2004) (AM / PM)
1	B	66	**71 / 73**
2	B	66	**68 / 68**
3	B	66	61 / 61
5	B	66	63 / 64
7	B	66	**67 / 69**
8	B	66	**66 / 68**
9	C	71	68 / 69
10	B	66	61 / 61
11	C	71	**71 / 73**
12	C	71	68 / 69
13	B	66	65 / 65
14	C	71	62 / 62
15	C	71	59 / 58
16	C	71	63 / 61
17	C	71	62 / 62
19	B	66	65 / 65
21	B	66	61 / 60
24	B	66	63 / 64
26	B	66	**66 / 66**

Note: Bolding indicates noise levels that approach or exceed the NAC.

Impacts

Construction Impacts

Daytime construction is considered temporary in nature and is exempt from local noise regulations. The newly enacted City of Redmond noise standards (RCDG 20D.100), which is based on WAC 173-60, exempts most construction activities from noise restrictions during daytime hours. Construction noise impacts during nighttime hours are possible for residential areas adjacent to the project and are prohibited unless the administrator or director of the City of Redmond's Department of Public Works approves expanded work hours. The following are the new daytime hours when construction on state highways and local arterials are exempt:

- Monday through Friday: 7:00 AM to 7:00 PM
- Saturdays: 9:00 AM to 6:00 PM
- Sunday or Legal Holiday: Prohibited

Any construction work outside these hours would require a noise variance from the City of Redmond; these are typically acquired during the project construction-permitting phase.

Operational Impacts

After eliminating the seven receptor sites discussed in "Affected Environment," 19 of the original 26 receptor sites remain. These 19 sites were analyzed for operational impacts. Table 3.8-5 identifies projected operational noise impacts in the project design year and the relevant FHWA NAC for the 19 analyzed sites. As shown in Table 3.8-5, none of these receptor sites would experience a substantial increase in noise levels of 10 dB or more over existing noise levels.

Eleven sites (shown in bold in Table 3.8-5) would be considered impacted due to sound levels that approach or exceed the NAC. Seven category B sites (see Table 3.8-1) would be impacted, including the following:

- Receptor Site 1: The Redmond Motor Inn, a commercial site
- Receptor Sites 2, 5, 7, and 8: Residential sites
- Receptor Sites 13 and 26: Park recreational sites

The Bear Creek Trail, Receptor Site 19, is an impact site that could be included in category B or treated as a nonnoise-sensitive land use; this is because this site is partially funded by public transportation funds and would be part of the trail network that includes other transportation projects. Most funding for this trail, however, comes from recreational sources, which confirms that we would treat the Bear Creek Trail as a category B-level impact.

Receptor Sites 9, 11, and 12 would be commercial category C level impacted sites; none of these sites had outdoor activity areas that would be affected by high sound levels.

TABLE 3.8-5
SR 520 Noise Projections Summary for the AM and PM Peak Hours

Receptor Site Number	FHWA Land Use Activity Category	FHWA Noise Abatement Criteria	Existing (2004) (AM / PM)	No-Action Scenario (2030) (AM / PM)	Project (2030) (AM / PM)
1	B	66	**71 / 73**	**73 / 75**	**74 / 75**
2	B	66	**68 / 68**	**69 / 68**	**69 / 69**
3	B	66	61 / 61	62 / 62	62 / 62
5	B	66	63 / 64	65 / **66**	65 / **66**
7	B	66	**67 / 69**	**69 / 70**	**68 / 70**
8	B	66	**66 / 68**	**67 / 69**	**67 / 69**
9	C	71	68 / 69	69 / **71**	**71 / 71**
10	B	66	61 / 61	63 / 62	63 / 63
11	C	71	**71 / 73**	**72 / 74**	**72 / 74**
12	C	71	68 / 69	69 / **71**	69 / **71**
13	B	66	65 / 65	**66 / 66**	**66 / 67**
14	C	71	62 / 62	63 / 63	66 / 65
15	C	71	59 / 58	60 / 59	63 / 63
16	C	71	63 / 61	64 / 61	65 / 64
17	C	71	62 / 62	63 / 63	64 / 64
19	B	66	65 / 65	**66 / 66**	**67 / 66**
21	B	66	61 / 60	62 / 61	62 / 61
24	B	66	63 / 64	65 / 65	65 / 65
26	B	66	**66 / 66**	**67 / 67**	**67 / 67**

Note: Bolding indicates noise levels that approach or exceed the NAC.

Mitigation Measures

Construction Mitigation

As discussed in "Impacts" above, daytime construction noise is considered temporary and is exempt from local noise regulation. If, however, nighttime construction activities are required, a variance would be required from the City of Redmond's noise standard, RCDG 20D.100. Mitigation typically considered for nighttime construction activities during the permitting phase includes the following:

- Using rubber bed liners for export haul vehicles

- Using ambient sensitive back-up warning devices or back-up observers in lieu of these devices as permitted by WAC 296-155-610
- Shielding light plants and other engine-powered generators and compressors, as necessary
- Removing spilled material and debris on paved surfaces by sweeping (not by metal scraping on pavement)

Operational Mitigation

The 1992 Final EIS recommended locations where a 2.7-foot traffic barrier could be used to mitigate the traffic noise from the proposed roadway. While this barrier might reduce the noise climate to the affected receivers, it cannot be considered appropriate mitigation because it would not provide a meaningful noise reduction. The 1992 Final EIS considered and recommended these barriers because they would reduce sound levels to or below the NAC or the existing sound levels. Neither of these goals is considered to be a reasonable objective of FHWA's noise regulations, WSDOT noise policies, or the City of Redmond CDG. The mitigation analysis in this addendum uses current prevailing regulations and policies in considering the reasonable and feasible mitigation that would be approved and recommended for this project.

The restaurant located at Receptor Site 9 represents many of the commercial establishments along the SR 202 corridor. Local street access to SR 202 is essential for the commercial nature of this and all businesses along SR 202. Constructing noise barriers would block access and adversely impact this restaurant; it would also block the visibility of the business, adversely affecting trade. The storage businesses along SR 520, represented by Receptor Sites 11 and 12, also would be adversely affected if a barrier were constructed to block visibility to these facilities. Storage units, by their nature, are the most compatible type of land use adjacent to highway facilities. Further consideration of mitigation for the commercial category C impact locations is not warranted.

Motels, such as the one represented by Receptor Site 1, would also be adversely impacted by noise barrier construction. No unshielded outdoor activity areas were identified for this location.

There are 12 front-row units of the Marymoor Heights Condominiums represented by Receptor Site 2. The only outdoor activity areas identified for these units were large decks facing the westbound on- and off-ramps to be constructed for the project. Receivers were added to the noise model to represent these decks. Sound levels for these receivers would be between 66 and 70 dBA. According to the information provided in Table 3.8-2, the maximum allowable noise barrier would be approximately 10,300 square feet and cost approximately $550,000. A 10- to 20-foot-tall barrier was analyzed; however, the costs would exceed the allowable amount and the barrier would not provide the required 5 to 7 dBA reduction in noise levels required by WSDOT. Due to the topography (upward slope from the roadway to the condominiums) and the building height (three stories) the minimum noise reductions were impossible to achieve with a noise barrier placed within Washington State right-of-way. The outcome is that a noise barrier is not feasible or reasonable at this location.

Receptor Sites 5, 7, and 8 represent impacted apartment residents northeast of West Lake Sammamish Parkway on either side of Leary Way. A substantial amount of traffic noise comes

from the local streets. A noise barrier constructed on the WSDOT right-of-way would not reduce noise from these sources; it would, therefore, not be feasible to reduce noise to these receptors.

Receptor Sites 13 and 26 in Marymoor Park have sound levels approaching or exceeding the NAC. The King County Parks and Recreation Department provided park use information on the active recreation fields and facilities adjacent to SR 520; WSDOT's DD22-22 was subsequently used to convert these use figures into residential equivalents. Maximum use of the park facilities within 500 feet of the highway represents a residential equivalent of 20.3 households. The predicted noise level for 2030 would be 66 to 67 dBA. A noise barrier to benefit all park receptors would need to be 3,456 feet long. Based on the reasonable allowable figures in Table 3.8-2, the barrier would be over 4.5 feet tall or have a total area of 15,631 feet.

Analysts studied a barrier to replace the 2.7-foot tall barrier recommended in the 1992 Final EIS. A range of barriers from 6 to 16 feet tall was analyzed, and a 12-foot barrier was determined to substantially reduce noise levels for park users. This barrier would measure approximately 41,470 square feet and cost $2,214,500, thereby exceeding the maximum allowable cost; therefore, neither barrier adjacent to Marymoor Park would be included in the project.

The Bear Creek Trail (Receptor Site 19), located north of SR 520, would have noise levels of 66 to 67 dBA. The number of residential equivalents for this facility would be far less than those counted for Marymoor Park due south of the trail. Also, because a noise barrier would need to protect the trail users for the whole distance between SR 202 and West Lake Sammamish Parkway, the barrier would be much longer. A noise barrier would clearly not be reasonable for this location.

After reviewing the noise analysis in the 1992 Final EIS, and the subsequent additional noise analysis conducted for this addendum, the noise discipline team concluded that none of the noise barriers evaluated to reduce noise impacts of this project were both feasible and reasonable. Consequently, no mitigation for operational noise impacts resulting from this project is proposed.